years) and 125 women (mean age, 70.0 ± 11.2 years; P = NS). Women were more likely to undergo treatment for critical limb ischemia (87.7% vs 77.7%; P = .028) and less likely to have treatment for claudication (12.3% vs 22.3%; P = NS). Women were also more likely to undergo balloon angioplasty (57.5% vs 68.9%; P = .043). However, men were more likely to have coronary disease, history of coronary bypass grafting, and chronic renal insufficiency. TransAtlantic Intersociety Consensus distribution, incidence of smoking, and diabetes were equivalent in both sexes. When adjusted for comorbidities, women had higher 24-month primary patency rates (46.0% ± 6.1% vs 30.4% ± 5.9%; P = .016) and limb salvage rates (87.5% ± 4.1% vs 82.9% ± 5.4%; P = .041) than men for tibial lesions with concurrent proximal disease. The difference in 24-month patency between women and men was more pronounced for isolated tibial lesions (50.1% ±10.1% vs 28.8% ± 10.4%; P = .002). Although the overall complication rates were similar, women had comparatively higher rates of postoperative access site thrombosis than men (8.9% vs 0.6%, P = .001).

Conclusions: Overall, endovascular interventions below the knee are safe and effective in women and should be considered the first-line modality for the management of critical tibial occlusive disease. However, further investigation and development of technique to better fit the female anatomy is necessary to improve the gender-related disparity in access site-related complications.

The Minimally Invasive Management of Visceral Artery Aneurysms and Pseudoaneurysms

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Objective: Minimally invasive endovascular and percutaneous methods are now available for the management of visceral artery aneurysms and pseudoaneurysms. This study reviewed our 10-year experience with the minimally invasive treatment of visceral artery aneurysms.

Methods: The review included all patients evaluated from June 1999 to June 2009 with the diagnosis of aneurysms of the celiac, superior mesenteric, and inferior mesenteric arteries and their branches. Medical records were reviewed for demographics, therapy, and results.

Results: Minimally invasive management was attempted in 185 aneurysms in 176 patients (56% men; mean age, 58 years). Intervention was successful in 182 of 185 (98%) aneurysms in 173 patients. Sixty-three (34%) aneurysms were located in the splenic artery, 56 (30%) in the hepatic artery, 28 (15%) in the gastroduodenal, 16 (8.6%) in the pancreaticoduodenal, 6 (3.2%) in the superior mesenteric, 4 (2.1%) in the gastric, 4 (2.1%) in the celiac, 4 (2.1%) in the gastroepiploic, 2 (1%) in the inferior mesenteric, and 1 (0.5%) in the middle colic artery. Pseudoaneurysms were more common than true aneurysms (64% vs 36%). Acute bleeding was the indication for intervention in 86 aneurysms (46%). Initial treatment was successful in 177 aneurysms (96%). Five aneurysms (3%) required additional intervention ≤30 days for persistent flow or bleeding. Coiling was the sole technique used in 139 aneurysms (75%) and was combined with at least one other technique in 20 other aneurysms (11%). Thirty-day aneurysm-related mortality was 1% (2 deaths). Nine (4.8%) additional deaths occurred during the 30-day follow-up, but none were related to complications of the aneurysms.

Conclusions: Minimally invasive intervention for visceral artery aneurysms can be used alone or in combination to effectively treat these aneurysms in elective or emergency conditions.

Our Experience with 140 Visceral Artery Stents: Should Celiac Artery Stenting be Abandoned?

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Objective: Open bypass is the gold standard treatment for mesenteric ischemia. With the refinement of endovascular therapy, visceral stenting is an attractive minimally invasive alternative but has limited data, and which vessel(s) respond best to stenting has not been addressed. This study compared the outcomes of superior mesenteric artery (SMA) and celiac artery (CA) stenting.

Methods: All consecutive patients who received visceral stenting between January 2002 and May 2009 were reviewed. Standard statistical analysis, including Kaplan-Meier, was performed. Primary patency was defined as a peak systolic velocity <350 cm/s for the CA and <450 cm/s for the SMA. A stenosis of ≥50% at arteriography was considered a loss of primary patency.

Results: Visceral stents were placed in 140 patients: SMA in 92 (65.7%), CA in 40 (28.6%), and inferior mesenteric artery in 8 (5.7%). There were 29 men (20.7%) and 111 women (79.3%) with a mean age of 72.9 years (range, 20.5-93.9 years). Mean follow-up was 12.8 months. Technical success was 100% for all. The 30-day mortality rate was 0% for the SMA and 5% for the CA. One-year primary patency was 55% for the SMA and 17% for the CA (P < .0001). Loss of CA primary patency was associated with ischemic heart disease (P < .05), stent diameter of <6 mm (P = .042), and age <50 years (P = .038). These factors did not correlate with loss of primary patency for the SMA (Fig).

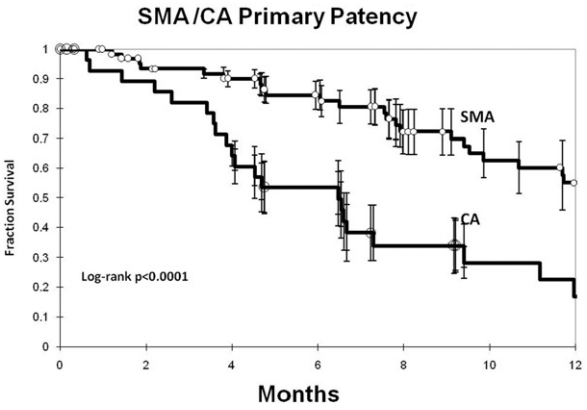

Fig.

Conclusions: Visceral stenting has an exceptional technical success rate, with low procedural mortality. Primary patency of the SMA group was significantly higher than that for the CA. Our data suggest that CA stenosis, especially in young patients and those with small vessels, does not respond well to stenting. Therefore, the practice of celiac artery stenting should be abandoned.

Ten-year Experience with Renal Artery In-stent Restenosis

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Objective: Endovascular interventions for symptomatic renal artery stenosis have become the first-line treatment. Limited data are available for the long-term outcome of secondary interventions of recurrent renal artery stenosis after stenting.

Methods: This was a retrospective analysis of a 10-year experience with percutaneous renal artery interventions. Only patients presenting with recurrent symptomatic stenosis were reviewed. End points analyzed included freedom from tertiary procedures, a decrease in baseline renal function >20%, patency confirmed by duplex imaging, freedom from hemodialysis, and patient survival.

Results: The review included 948 patients with 1150 renal arteries treated; of these, 123 arteries in 108 patients (68.9% women) presented with symptomatic recurrent stenosis, comprising recurrent hypertension in 97% and renal insufficiency in 67%. The average age was 68.9. Mean follow-up was 30 months (range, 1.2-104.7 months) for patency and 56 months (range, 6.2-112.7 months) for creatinine level. Secondary interventions included percutaneous transluminal angioplasty (PTA) only in 27, PTA with cutting balloon in 9, repeat renal artery stenting in 80, and drug-eluting stent (DES) placement in 7. After secondary interventions, 20 of the 123 arteries (16.3%) in 18 patients required tertiary interventions. Freedom from tertiary interventions was similar among treatment modalities, with PTA, PTA-cutting balloon, stent, and DES groups having 81.5%, 100%, 83.8%, and 71.4%, respectively, of patients remaining procedure free. Forty patients (37%) had a decrease in renal function >20%, and 24 (22.2%) remained or progressed to renal failure (estimated glomerular filtration rate <30%), and eight ultimately required hemodialysis. Patient survival was 72.8% at 5 years.

Conclusions: Secondary interventions for in-stent restenosis have similar functional results as those seen for the primary intervention. Angioplasty appears to have similar results to secondary stenting.

Differences in Anatomy and Outcomes in Patients Treated with Open Mesenteric Revascularization Before and After the Endovascular Era

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Objectives: Endovascular revascularization (ER) is currently the preferred treatment method in patients with chronic mesenteric ischemia (CMI). The aim of this study was to compare differences in clinical characteristics, anatomy, and outcomes in patients treated with open mesenteric revascularization (OR) before and after the endovascular era.

Methods: Two-hundred and forty-one patients treated for CMI (51.8% ER; 48.2% OR) between 1998 and 2009 were entered into a prospective database. Since 2002, ER was used in 102 patients (63.8%) and OR in 58 (36.3%) because ER was not possible, failed, or the patient had unfavorable lesions. We reviewed the clinical data and outcomes of patients treated with OR before (group A) and after (group B) the preferential use of ER in 2002. Computed tomography angiography with centerline measurement and conventional angiography were used to assess differences in anatomy.

Results: OR was used to treat 58 patients in group A and 58 in group B. Both groups had similar demographics, risk factors, and clinical presentation, with the exception of more ($P < .05$) cardiac interventions, dysrhythmias, abdominal pain, and food fear in group B. Patients in group B had more extensive disease, including more superior mesenteric artery (SMA) occlusions (45% vs 67%, $P = .02$). There were no differences in operative mortality (1.7% vs 3.4%), complications (43% vs 53%), and length of stay (both 12 ± 1 days) for group A and B, respectively (P = NS). Symptom improvement was noted in 88% of group A patients and in 86% of group B patients (P = NS). Mean follow up was 56 ± 7 months in group A and 22 ± 3 months in group B ($P < .01$). At 1-year, there were no differences in patency and recurrence rates between groups.

Conclusions: Open mesenteric revascularization is currently indicated in about 36% of patients with CMI. Despite the presence of more extensive mesenteric disease in patients currently treated with OR, outcomes have not changed compared with those achieved before the preferential use of mesenteric stents.

Comparison of Modern Open Repair of Infrarenal and Pararenal Abdominal Aortic Aneurysms: Early Outcomes and Late Renal Dysfunction

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Objectives: Open repair of infrarenal (IAAA) and pararenal (PAAA) abdominal aortic aneurysms (AAA) continue to be performed in an endovascular era. This study was conducted to review contemporary results of elective open AAA repairs and determine predictors of death and acute and late renal dysfunction.

Methods: A retrospective single-institution review identified 417 consecutive patients with available data who underwent elective open AAA repairs between July 2000 and June 2007. Demographic, preoperative, intraoperative, and postoperative variables were collected. Renal dysfunction was defined as an increase in creatinine of ≥0.5 mg/dL from baseline. Multiple logistic regression models were used to identify predictors of death and renal dysfunction.

Results: A total of 232 IAAA (55.6%) and 185 PAAA (44.4%) repairs (156 juxtarenal [JAAA] and 29 suprarenal [SAAA]) were performed in 294 men and 123 women with a mean age of 71.7 years. Concomitant renal artery reconstruction was performed in 20 patients. Baseline characteristics, including creatinine levels, did not differ among groups, except for age (70.4 years, IAAA; 73.1 years, JAAA; 73.7 years, SAAA; $P = .006$). Overall operative mortality was 4.8%: IAAA, 3.9%; JAAA, 5.1%; and SAAA, 10.3% ($P = .30$). Postoperative myocardial infarction and pulmonary complications were independent predictors of in-hospital death, but type of AAA was not. Occurrence of postoperative renal dysfunction increased with the extent of the AAA; 15.4% IAAA, 32.3% JAAA, and 48.3% SAAA ($P < .001$), requiring new-onset hemodialysis in 0.9% (2 of 226), 1.3% (2 of 155), and 10.7% (3 of 28), respectively ($P < .001$). The incidence of renal dysfunction was, respectively, 1.7%, 6.0%, and 15.4% ($P = .038$) at 1 year and 5.6%, 16.7%, and 37.5% ($P = .003$) at the last follow-up, without development of hemodialysis dependence. Independent predictors of early renal dysfunction were PAAA, hypertension, and AAA size; and of late renal dysfunction, SAAA.

Conclusions: Open PAAA repair can be done without a significant increase in death compared with open IAAA repairs. Acute and late renal dysfunction is related to the extent of AAA and warrants close surveillance. These data may serve as a benchmark against which outcomes of endovascular aneurysm repair are compared.

Hemodialysis Reliable Outflow (HeRO) Catheter Outcomes in Patients with Long-standing Renal Failure: Optimizing Performance

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Objectives: Owing to the increasing population of access-challenged dialysis patients, the Hemodialysis Reliable Outflow (HeRO) device is becoming a more recognized alternative option for patients who have a tunneled dialysis catheter (TDC). We have developed criteria and risk factors that we hope will improve patency, reduce infection, and ultimately improve the performance of the HeRO device in this high-risk population.

Methods: All HeRO implants from May 2008 through June 2009 at a single institution were retrospectively reviewed. Patient demographics, history, and implant success were evaluated. Cephalosporin was the preferred prophylactic antibiotic. Primary outcomes were successful implantation, patency rates, and infection. Secondary outcomes were morbidity and death.

Results: The HeRO device was successfully implanted in 40 of 42 procedures (95%). Mean age was 57.5 years. Most (95%) were African American with at least two major comorbidities, and 39 patients were TDC-dependent. Mean duration on hemodialysis was 7.6 years. Mean number of hemodialysis catheters, arteriovenous grafts, and arteriovenous fistulae per patient before implant were 7.2, 1.4, and 1.9, respectively. The overall infection rate was 20% (n = 8), with a device-adjusted infection rate of 1.09/1000 device-days, with seven occurring in patients with insulin-dependent diabetes (17.5% vs 2.5%, $P = .007$). One-month patency was 90%, with 21 (53%) using the HeRO for dialysis after a mean follow-up of 4.1 months. Device thrombosis was less likely to develop in patients taking Plavix (0% vs 32.5%, $P = .025$). The number of prior access procedures (>5) was associated with device thrombosis (2.5% vs 45%, $P = .005$) and device-related infections (0% vs 20%, $P = .021$). The 30-day mortality was 13% (n = 5), which was not related to the procedure. Overall 1-year survival was 72.5%.

Conclusions: In this high-risk patient population, the HeRO device can be placed successfully, with low morbidity. Factors that may optimize performance include the postoperative use of Plavix, use of the device earlier in traditional dialysis-access algorithms, and possibly, the perioperative administration of broad-spectrum antibiotics.

Existing Trauma and Critical Care Scoring Systems Underestimate Mortality Among Vascular Trauma Patients

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Objectives: The effect of vascular injuries on patient mortality has not been well documented in multitrauma patients. This study sought to determine whether the presence of vascular injury negatively affected patient outcome compared with nonvascular trauma (NVT) patients and the utility of existing severity scoring systems in predicting death among vascular trauma (VT) patients.

Methods: The trauma database from January 2005 to December 2007 was retrospectively reviewed. Demographics, Injury Severity Scores (ISS), Revised Trauma Scores (RTS), Acute Physiology and Chronic Health Evaluation (APACHE) II scores, and death were compared with control patients selected from a matching cohort based on ISS. Comparisons were made between VT and NVT patients grouped into categories of severity based on the scoring systems. These systems have been shown in the literature to be predictive of mortality. Statistical analysis was performed using χ^2 analysis and t tests.

Results: We identified 50 VT and 50 NVT patients, with no significant differences in age, gender, mechanism of injury, ISS, or RTS. The mean APACHE II score was 12.3 in VT patients vs 8.8 in NVT patients ($P < .05$). Overall mortality was 24% in VT patients vs 11.8% in NVT patients, but this did not reach statistical significance ($P = .108$). VT patients with an RTS >5 had a higher mortality rate (26% vs 2.2%, $P = .007$). VT also predicted higher mortality in patients with an ISS >24 (61% vs 28.6%, $P = .04$). Finally, VT patients with an APACHE II score <14 also had a higher mortality rate (18.2% vs 0%, $P = .007$; Table).